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ABSTRACT

This paper reviews psychological literature concerned with aging, and includes brief reviews of (a) motor skill work, (b) the phenomena of "slowing," (c) social psychological findings, (d) sensation and perception, and (e) selected learning characteristics. The following teaching and learning strategies were elicited from this study: (a) flexibility as a goal should be stressed, rather than performance goals or quantity of learning; (b) training in pacing responses at a personal speed is important; (c) increased periods between stimuli benefit the elderly, both for inspection and anticipation; (d) response repression or error commission may be the result of fast or imposed pacing; (e) the arousal level of the elderly is important to performance, since motivational levels and interest decline; (f) aids to learning, either artificial or natural, such as mediating techniques, have proven helpful; (g) learning and performance must be treated separately. (JS)

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SOME PSYCHOLOGICAL ASPECTS OF AGING: IMPLICATIONS FOR TEACHING AND LEARNING

Age and time are nearly synonymous terms for most people. The baby matures, reaches adolescence, moves into adulthood, acquires responsibilities, peaks in middle age, notices declines in function and finally combats the inability to adapt to environmental demands and either succeeds for awhile or ceases to exist. Aging is not a voluntary activity but a peculiar phenomenon of all living organisms, plant and animal, for which there is nc remedy. To define aging is a difficult proposition because the mere passage of time is not a cause of the biological phenomena which occur and yet, they are time bound. Consider chronology of age as a definition of aging and you are faced with a wide range of individual differences in physiological response to physical stress, physical appearance (skin, hair, etc.), psychological styles and social competence. Immobilization (bed rest studies) over periods of time can cause the physiological responses of the body to resemble aging. Certain diseases can cause premature aging where a twelve year old body resembles and functions as if it were eighty.

In short, an explanation and definition for aging is elusive and an appreciation of the multi-variate nature of the collection of phenomena (biological, psychological and social) included in the term aging is a prerequisite to the conceptualization of aging. In The Coming of Age, Simone de Beauvior states:

> "In fact, as far as our own species is concerned, old age is by no means easy to define. It is a biological phenomenon - the elderly man's organism displays certain peculiarities. It brings with it psychological consequences - certain forms of behavior are rightly looked upon as being characteristic of old age. And like all human situations, it has an existential dimension - it changes the individual's relationship with time, and therefore, his relationship with the world and with his own history. Then again, man

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> never lives in a state of nature; in his old age, as at every period of his life, his status is imposed upon him by the society to which he belongs. What so complicates the whole problem is the close interdependence of all these points of view (14)."

We might broadly define aging as the declining ability of the individual to adapt to environmental demands especially during the last quarter of the life span where the probability of death is greatly increased. Barring accidents, disease and other unforeseen circumstances of life, we accept natural aging as inevitable and think of people as old who have, at least, retired.

Birren (5) argues that aging needs to be defined as beginning when size, form and function have arrived at a steady state, otherwise it would be difficult to distinguish between growth and aging where both are characterized by irreversibility and accumulation. There is some serious question whether aging is random or programmed through genetics (biochromicity) for selective deterioration. Various models and explanations for aging have been suggested. There is a factor model which proposes a "self destruct" idea as a result of disease and hypoactivity, circulatory failure, noxious chemicals or sinister hormones. Another idea is a simple "wear and tear" machine model which views acceleration of aging where body parts are most vulnerable due to overloading and stress. The "second childhood" notion is a common phrase and implies reduction of mental capacity (senility) and the regression of the organism along the lines of early development. These theoretical notions about aging are typically ill-developed because most of the work in the vast field of gerontology has been exlusively data collection-oriented with a dearth of

speculation which is so necessary for theoretical structures. Most of the available data appears in the Journal of Gerontology and is now being produced by an active research enterprise both by established scholars and graduate students.

A growing literature exists concerning the medical, biological, psychological, sociological and retirement parameters of the aged. Psychological aging can be viewed a number of ways:

1. We can consider behavior and life style in relation to longevity.

2. We can consider the relationships that have been found between behavior and CV disease.

3. We can consider social roles and behavior in homogeneous vs. heterogeneous cultures (USA) and their effects on aging.

4. We can consider the individual and internalized feelings about personal aging - how do people experience aging and "model" it for themselves?

5. Last, we can consider man as an information system which in the process of aging, may increase the storage of information but search it more slowly. The old may process bigger chunks whereas the young may process more bits per unit time. In fact, the old may process too much information, both relevant and irrelevant.

Aging, for some persons, presents a great threat to the ego and can cause self-hate and fatalism especially where a person attempts to defend himself against aging. Many older persons simply withdraw or disengage themselves voluntarily from many activities and social settings which had defined a large part of their lives. Those who remain self-directed and interested in the world nearly always survive longer than those who become apathetic and passive.

It is possible that introversion and cautiousness would increase and achievement needs and responsiveness would decrease. Conforming behavior and depression are often easily noticed in the elderly. Retirement, of course, is a major event in the lives of especially males and may signal loneliness, isolation and a profound change in social competence. Rigidity in old age has been studied by a number of researchers (9, 12, 8, 24, 23, 11).

> "Old dogs and new tricks suggest not that advanced age is associated with lowered ability to learn but that advanced age is associated with a lowered ability to unlearn that which is already integrated into well established thought and behavior systems. Old dogs are less likely to develop new solutions to problems and new ways to doing things(8)."

Resistance to change is noted here which grasps cognitive, personal and motor factors in an inflexible embrace. These findings indicate something about the strategies for learning that must be employed with older persons. It might be best to have flexibility as a goal rather than performance goals or quantity of learning. A need for certainty is apparent here also and the related low-risk probability of mistake avoidance. In addition, it is known that as aging advances, many persons carefully alter their self-concept and feelings about their body which is gradually declining in efficiency. This lowered body esteem can contribute to a decreased motivation to exert oneself physically, feelings of inadequacy and fear of failure.

Welford's work (34) has laid a foundation of observation and questions upon which succeeding work in motor skills and age has been based. The phenomena of "slowing" of performance is such an observation in old age. Does this slowness result from decreased stimulus strength, perceptual limitations (central and peripheral), impaired memory (especially short term), cautiousness and rigidity, speed of responses (time limits),

increased reaction time (decision time) or inability to use feedback? Welford (33, 34, 35) suggested that central nervous system impairment was the main limitation and the presumed loss of capacity is reason enough for older persons to trade accuracy for speed of response. Complex tasks easily cause more problems; and, in fact, simple tasks may display little difference in speed and accuracy between young and old subjects. The ability to "pace" responses at a personal speed became another important variable in performance of the aged. A number of researchers have also pointed out the wide range of inter-individual variability among older performers but to date, intra-individual variability has yet to be studied.

Evidence for modification of sensation and perception in aging is clear and reliable (13, 30). Vision has received much attention and it can be documented that there are decreases in visual acuity, ability to focus, a need for increased illumination and changes in adaptation to darkness. The visual sense, then, can contribute to a decline in learning due to inability to gather pertinent evaluative feedback to provide appropriate adjustments. However, data on the kinesthetic feedback processes is virtually nonexistent although there is some work on persistence of stimulus traces in the somesthetic nervous system (3, 4). In these studies, older subjects were seen to persist in aftereffects (figural and spiral) much longer when compared to young subjects. The popular explanation is that since older persons are engaged longer in perceiving and responding, they will not be as responsive to new information and hence, will cling to the impression of old stimuli longer. This has direct implications for response amendment problems. More recently,

Welford (33) has pointed out that in subjects 18-33, 300 m/secs. was an average refractory period whereas for subjects 58-71, this period was 500 m/secs. and indicates poorer temporal resolution. Other sensory modalities, such as hearing, commonly undergo marked change with age and taste, smell, pain and touch seem to change as well but not as dramatically. Generally, the clearly documented decrease in peripheral nerve conduction speeds (5, 8, 9) has not convinced researchers that it is a factor to be carefully considered in perceptual speed. Speed of transmission is slowed in old subjects (51.4 m/sec versus 58.4 m.sec) but this decrease amounts to only 4% of the reported total decrease in time from 30 to 80 years.

There is some indication of changes in sensory organ reception thresholds at the periphery, but the data is sparse and incomplete. In short, the point of view, on the reception side, is that the slowing must be found within the CNS. The summation of synaptic delay in the CNS is one speculation. Decreased blood flow to the brain has seen some attention as lowering electrical activity due to oxygen lack (some say that this is the basis for senility and must be treated by oxygen administration). Premotor time has been shown to increase (32) and since it comprises possibly 80% of reaction time and includes the central interpretation (decision) time, it indicates CNS slowing. Preparation of a response program by the older person becomes difficult and set maintenance, including attention, is a contributing factor. Birren, and Botwinick, in a series of studies (6), attempted to correlate cognitive skills with reaction time in order to demonstrate the CNS location of slowing and produced correlations of $r = .30$ between paper - pencil tests and RT, $r = .53$ with digit symbols of the

WAIS and r = .60 with hearing loss. Clusters of correlations need to be looked at, and very probably, there is such a thing as specificity and generality of slowing, especially since aging is selective. Reaction time studies have been frequent in the literature of gerontology and generally indicate slowing with age especially in discriminative and choice situations (7, 18, 21, 31). The evidence does point to the CNS as the location for the slowing.

Surwillo (28, 29) indicates that there are alpha rhythm changes with age as part of the EEG and he regards this as a factor in slowing. He reports a correlation of r = .81 with reaction time and alpha rhythm and that alpha rhythm serves as a cyclic biological clock. This amounts to a hypothesis that alpha rhythm changes are a key to the observed slowing because of their internal timing role.

Rabitt (22) points out that senescent humans and obsolete computers is more than a whimsical analogy. A computer may be slow simply because its component switchery is slow. It may reduce data rapidly or slowly depending upon the program. Finally, the computer speed may be a direct function of its size and capacity. He feels that the old have been inefficiently programmed - their behavior may be a precaution against failing capacities and time is spent verifying each stimulus with extreme caution. Difficulty in separating signal from noise implies a loss of storage for cues, and analogs of input and this may indicate the necessity of sequential and not parallel stimulus interpretation. Some models of these complexities including the multi-variate nature of aging might be illustrative and helpful at this point in the speculations. Comparisons

of youthful age related change in these parameters with old age changes in "life span models" might be instructive. The notion of slowing simply needs a theory and models at this point before much more data is collected.

Memory has received quite a bit of attention from researchers in gerontology. A methodological problem is evident in most of the studies on memory which compare young and old subjects over retention periods of 24 hours to one week. Wimer and Wigdon (36) point out that the degree of original learning has not been controlled in most studies and may reflect the fact that an overlearned task is less subject to interference, and old subjects may not have learned enough to retain. In some paired associate research where original learning is controlled for, recall scores showed no difference between young and old ages over intervals up to one week (15, 16). This contradicts popular notions about forgetfulness and aging. Immediate or short term memory losses appear to be more severe in the aged.

It has been pointed out in rat studies that consolidation may be slower in later life and when combined with rate of response where a subject does not have the opportunity to self pace, perceptual traces may indeed be impaired so that a comparator for correction purposes is never coherent. McGhie, et. al. (19) found that a decline in immediate memory with age is much more severe for visual material. Schonfield and Robertson (27), working with lists of words, showed a greater loss of ability to retrieve (recall) rather than recognize (storage). Rates of search are involved heavily in recall and older persons do need longer time to retrieve information both in short and long term situations (1, 2, 20). Perhaps it is not retrieval which is the problem but the relative difficulty of tasks. Confusion in memory could be created by conflicts in length of task

(physical dimensions) and magnitude of responses required by the task. If there is a smaller capacity for storage, poor registration of information for future responses and inefficient search, then difficult task dimensions are likely to be confused due to their complexity.

Again, mainly with verbal material, research into learning has been instructive for those who wish to teach older persons. For the aged, it may be truer that learning may lack expression due to adaptation and correlated extraneous variables linked to performance. Pacing or the speed of presenting stimuli is crucial to the older person - he must be able to self pace. Often, old persons will make errors of omission rather than commission in decisions simply not to respond. Longer periods between stimuli benefit the elderly both for inspection and anticipation (10). Performance on paced tasks depends upon the stimulus duration, signal to noise ratio (ease of distinguishing the stimulus), the inter-stimulus interval and the number of responses per unit time. Fast pacing or imposed pacing will cause poorer performance due to failures in STM and attention where the old person does not have time to perceive and classify stimuli. Response repression may be the result or many errors of commission. The arousal level of older persons will have something to do with performance fluctuations since motivational levels and interest decline. This may be true for all of us but for the aged, it is peculiarly difficult since the older person needs familiarity and meaning for responses in greater and greater amounts. Aids to learning, either artificial or natural, as mediating techniques, have proven helpful in some studies (17). Giving help with associations so that a person understands the interrelated

nature of responses combats the impoverishment and even erasure of experience that may have happened over a life span.

It is essential that learning and performance be treated separately, especially in the case of the elderly. That performance will reflect learning is much less true for the multi-handicapped elderly whose biologically based constraints compromise all action. Many studies have confounded results haphazardly by not at least attempting to separate the organization of response from the decision to respond.

Literature has been available for some time concerning the learning and performance problems of the elderly. Virtually nothing exists concerning strategies for teaching the aged given the difficulties that aging has caused. We face a future with millions of aged persons, including you and I and no visible methodologies to enhance education during the latter stages of the life span. We see, we feel and we talk; and in the meantime, time is flying.

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